Ecosystems Enhancement Programme (EEP):

Strategy

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Credit - Denton Rumsey

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1 Foreword and Commentary

1.1 Foreword – Mark Shorrock

When I started Tidal Lagoon Power I knew I wanted the company to do things differently. Tidal Lagoon Swansea Bay represents not only a global proof of concept, but also a scaleable blueprint for full-scale tidal lagoons in the UK and internationally. As an energy company that seeks to harness the tides to generate clean electricity, a high quality functioning environment is at our very foundation. Economic growth doesn't necessarily have to be associated with degradation of the environment; quite the reverse – reverence for nature must be at the heart of our economy – our model for tidal lagoons combines the delivery of clean affordable energy with large scale biodiversity conservation. It is my ambition and belief that this can and should be done, and is what every developer should do.

In establishing the Ecosystems Enhancement Programme, to run alongside the lagoon development programme, we have the opportunity to become Europe's largest conservation initiative. Not only will we meet our legal requirements, we will go beyond this, by creating large areas of mudflat, saltmarsh and grazing marsh, and improving reens and rivers for fish, whilst providing other biodiversity enhancements; aiming to combat the ongoing declines that we are witnessing in nature as a result of the growing threats from climate change. On behalf of Tidal Lagoon Power, I invite and welcome working partnerships to take forward exciting conservation action in the UK, EU and globally.

In the face of the present requirement for c.25,000MW of generating capacity in the UK by 2030 and the strong threat that this will be delivered by non-CCS gas power stations, Tidal Lagoon Power will demonstrate that zero carbon energy schemes can provide large scale power while investing in the local economy and the natural environment. The time to change our approach to infrastructure development is now; and tidal lagoons will be homegrown. They will deliver green growth which in turn will deliver long term jobs and they must deliver for nature.

Mark Shorrock

CEO, Tidal Lagoon Power

1.2 Commentary – Dr Jane Davidson

The age old biodiversity question in the context of new developments is how they can be delivered in such a way that any environmental detriment is mitigated effectively. Some biodiversity efforts in the business context have seen success, on a similar principle to 'polluter pays'; where those who undertake development bear the cost of managing it to prevent damage to the environment. However, there are too many cases where what companies promise and what they deliver is unsatisfactory.

I was attracted to Tidal Lagoon Power's Ecosystems Enhancement Programme (EEP) because it has turned this age old problem on its head. The EEP initiative is designed to take a strategic approach to mitigation, compensation and enhancement, ahead of the project itself, so as to deliver a net positive outcome for biodiversity. Why should we settle for the avoidance of impacts or the achievement of a neutral outcome alone if we can create a net positive outcome? Such an approach to biodiversity and renewable energy projects is sorely needed to tackle climate change.

With the world's first tidal lagoon intended for Swansea Bay in Wales, we have the combination of a country with significant tidal resource that has enshrined its support for sustainability in legislation, the Well Being of Future Generations (Wales) Act, 2015. This new act, the first of its kind in the world, requires public bodies to plan and deliver for future generations, while maintaining and enhancing a biodiverse natural environment with healthy functioning ecosystems that support economic and ecological resilience and the capacity to adapt to change.

If the UK and the other countries of COP21 who signed the Paris deal last December are to meet their energy commitments, there needs to be significant upscaling of renewable energy installations, but that should not be at the expense of our environment. Tidal Lagoon Power has a vision for a tidal lagoon industry to drive forward the major transition to a low carbon economy in Wales and the UK. Through the EEP, we can now ensure that the business and environmental benefits are planned and executed together. It is my hope that the opportunity to turn this into a reality is seized and we see tidal lagoon projects delivering for business and biodiversity.

Dr Jane Davidson is Director of the award-winning Institute of Sustainable Practice, Innovation and Resource Effectiveness (INSPIRE) and Associate Pro-Vice Chancellor for External Stakeholder Engagement and Development at the University of Wales, Trinity Saint David. Jane was formerly Minister for Environment and Sustainability in Wales. She holds an honorary doctorate from the University of Glamorgan, honorary fellowships from CIW and CIWEM and is a Patron of CIEEM. Jane is also a member of WWF's UK Council of Ambassadors and Vice-President of Ramblers' Cymru.

2 Tidal Lagoon Power – *a response to climate change*

It has been 25 years since the International Panel on Climate Change's first Assessment Report called for united action to tackle climate change and set out the potentially serious consequences of inaction for society, biodiversity and national economies[1]. The 2015 United Nations Climate Change Summit (COP21), held in Paris, shone the global spotlight back onto the urgent need to respond rapidly to climate change, including further reducing carbon emissions and planning for adaptation to a changing climate. The deal struck in Paris, to hold global average temperature rises to no more than 2^0C above pre-industrial temperature and pursue efforts to limit it to 1.5^0C, is an imperative driver for energy generation to reduce greenhouse gas emissions – globally and locally. The UK Climate Change Act 2008 sets a legally-binding target for the UK to reduce greenhouse gas emissions by at least 34% by 2020, and at least 80% by 2050, compared to 1990 levels. This requires major investment and institutional change to decarbonise the UK economy while ensuring secure and affordable energy supplies[2].

With a number of gas and coal-fired power plant reaching the end of their lifespan, and the UK's nuclear programme not running at the pace previously thought, there is an urgent need for low carbon energy generation at scale. The UK has the best tidal range resource in Europe and the second best in the world. UK tidal barrage schemes have historically faltered due to serious concerns over their environmental impact, leaving tidal lagoons as the primary option for exploitation of this unique resource. Comprising a harbour type structure (breakwaters incorporating hydro turbines), tidal lagoons generate electricity by harnessing the natural rise and fall of the tides; a reliable and entirely predictable source of energy. Tidal Lagoon Power's (TLP's) first project, Tidal Lagoon Swansea Bay, will provide a scalable blueprint for lagoons. Beyond this, TLP aims to develop, construct and operate a fleet of tidal lagoons to meet up to 8% of UK electricity demand. Tidal Lagoon Cardiff is the most advanced of the full-scale fleet lagoons, with other projects being considered elsewhere in the Severn Estuary, north Wales and the north west of England.

TLP believe that the creation of a UK tidal lagoon industry will support not only climate change mitigation but also future resilience and climate adaptation. The UK's Inter-agency Climate Change Forum highlights the important role of biodiversity within both mitigation and adaptation. Effort is needed to address the likely and wide ranging impacts of climate change on habitats and species, including warming seas and changes in distribution and abundance, the timing of seasonal events and habitat use[3]. Communities will also continue to experience the influence of a changing climate, such as sea-level rise and more frequent and intense rainfall events, giving rise to flooding and significant disruption[4].

[1] World Meteorological Organisation / United Nations Environment Programme IPCC (1990). Climate Change: The IPCC Scientific Assessment. [https://www.ipcc.ch/ipccreports/far/wg_I/ipcc_far_wg_I_full_report.pdf]; updated in IPCC (2014). Climate Change 2014 Synthesis Report Summary for Policymakers. [http://www.ipcc.ch/report/ar5/syr/].

[2] DECC (2011), Overarching National Policy Statement for Energy [https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf].

[3] IACCF (2010) Biodiversity and Climate Change in the UK (Eds. Procter, D.A., Baxter, J.M., Crick, H.P.Q., Mortimer, D., Mulholland, F. Walmsley, C.A.). JNCC, Peterborough, pp.16. [http://jncc.defra.gov.uk/PDF/Pub10 _Bio_&_CC _IACCF_2010_Web.pdf].

[4] http://www.metoffice.gov.uk/media/pdf/n/i/Recent_Storms_Briefing_Final_07023.pdf.

Such changes in the natural world driven by climate change are set within a context of long term declines in biodiversity in the UK and globally[5], that ultimately require a shift to more strategic approaches to managing natural resources. Solutions based on an ecosystem approach hold the greatest promise for promoting and delivering the sustainable use of natural resources. The Convention on Biological Diversity (CBD) defines the ecosystem approach as *"A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way"*[6]. In Wales, this shift was endorsed by the National Assembly's Sustainability Committee Inquiry into Biodiversity, which recommended that the Welsh Government should adopt a strategic ecosystems approach to the management of biodiversity in the wider countryside, and this is now embedded in the Environment (Wales) Act, 2016. This approach is being echoed in England, within Defra's Biodiversity 2020 Strategy, and at the European level within the Commission's Biodiversity Strategy.

TLP recognises that any proposal for large-scale tidal energy generation will need to find ways to meet EU and UK environmental obligations and support biodiversity conservation. It also appreciates the complexity of the environmental challenges introduced by development in coastal and marine areas and, in particular, hyper-tidal estuarine environments such as the Severn Estuary designated for habitats and species of European importance, and inherently valuable for nature and those communities who live around the estuary. In response to this, TLP has established an Ecosystems Enhancement Programme (EEP) to accompany and facilitate lagoon development. The EEP aims to exceed EU and UK obligations and have a net positive effect for biodiversity. This will be delivered through a targeted nature conservation programme that is likely to include the creation of wetland habitat on an unprecedented scale, restoration efforts for migratory fish and birds, and wide ranging European-scale biodiversity conservation initiatives. Such a fresh approach is intended to provide a blueprint for future infrastructure projects.

TLP believe that low carbon energy projects can significantly contribute to nature conservation, not only through climate change mitigation, but through large scale biodiversity conservation efforts (see Figure 1 below).

[5] UK National Ecosystem Assessment (2014). The UK National Ecosystem Assessment: Synthesis of the Key Findings. UNEP-WCMC, LWEC, UK. [http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx]; and Millennium Ecosystem Assessment (2005). Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC. [http://www.millenniumassessment.org/documents/document.356.aspx.pdf].

[6] https://www.cbd.int/ecosystem/.

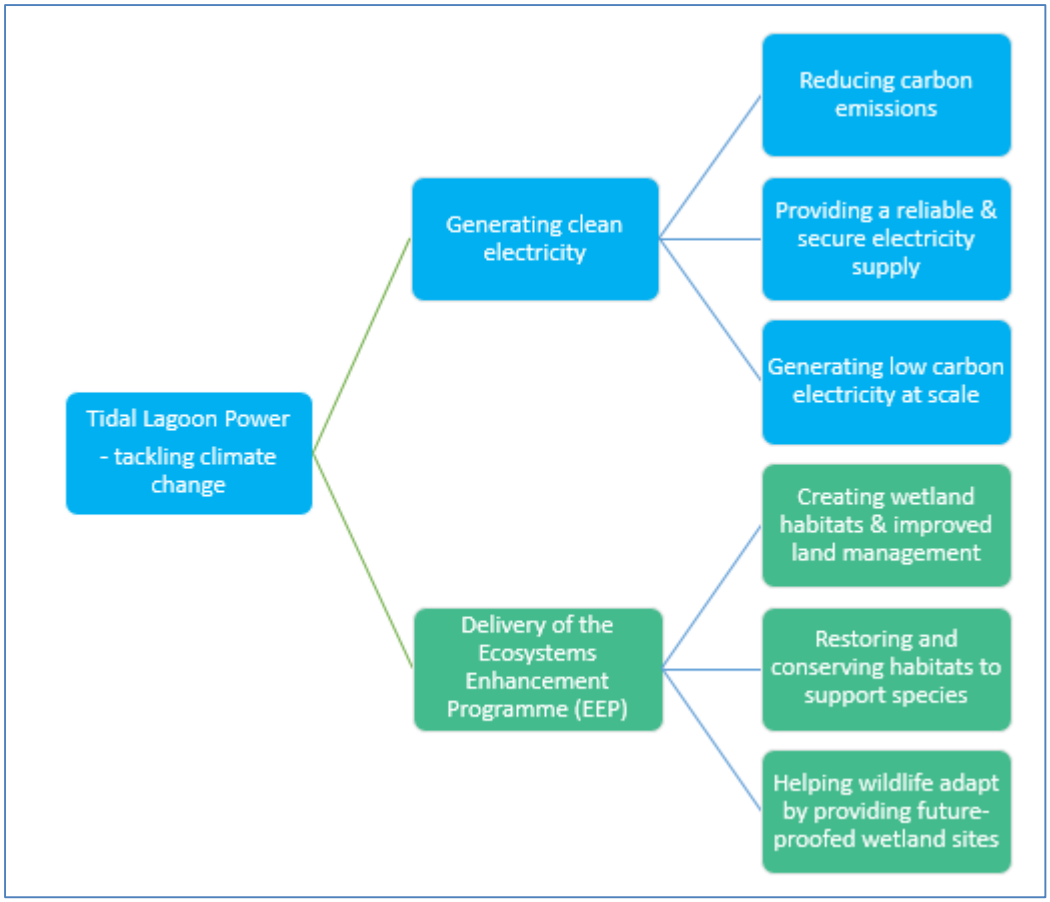

Figure 1: Tidal Lagoon Power is tackling climate change through the delivery of a range of mitigation and adaption actions, with the EEP delivering a number of these.

3 The Ecosystems Enhancement Programme – *to accompany tidal power*

3.1 Vision and Aims

The vision of the EEP is *to have enhanced biodiversity alongside the generation of clean energy by 2030*. This will be achieved through a dedicated nature conservation programme (the EEP) that will deliver and manage conservation initiatives.

The EEP has three central aims:

1. *To have a net positive effect on biodiversity (that is, to go beyond the avoidance of impacts or the achievement of a neutral outcome alone).*
2. *To address the compensation and ecosystem scale mitigation requirements TLP anticipate will arise from tidal lagoon development.*
3. *To foster innovative and collaborative partnerships to deliver conservation action in the UK, EU and globally.*

As depicted in Figure 2 below, there is a clear relationship and a dependency between TLP's lagoon programme and the phased delivery of the EEP, particularly with respect to the delivery of any compensation commitments associated with the lagoons. However it is anticipated that in the longer term the EEP's financial dependency on TLP will reduce (through the generation of its own income), thus increasing its capacity to undertake non-lagoon related biodiversity conservation potentially at a European and global scale as well as in the UK.

A strong governance structure will be put in place for the EEP (as a conservation enabler) to ensure appropriate, independent oversight (this is detailed further in Section 5). While any legal obligations for the provision of compensatory habitat will remain with the lagoon operator for the life of the relevant lagoon projects (i.e. for 120+ years), the delivery and management of such habitats (sites) will be overseen by the EEP and could be delegated to others. Where delegation occurs, management agreements will be put in place between TLP/the EEP and the site managers to ensure that the conservation features of the site are maintained; this could include putting in place certain restrictions on the activities that can be undertaken on the land in question.

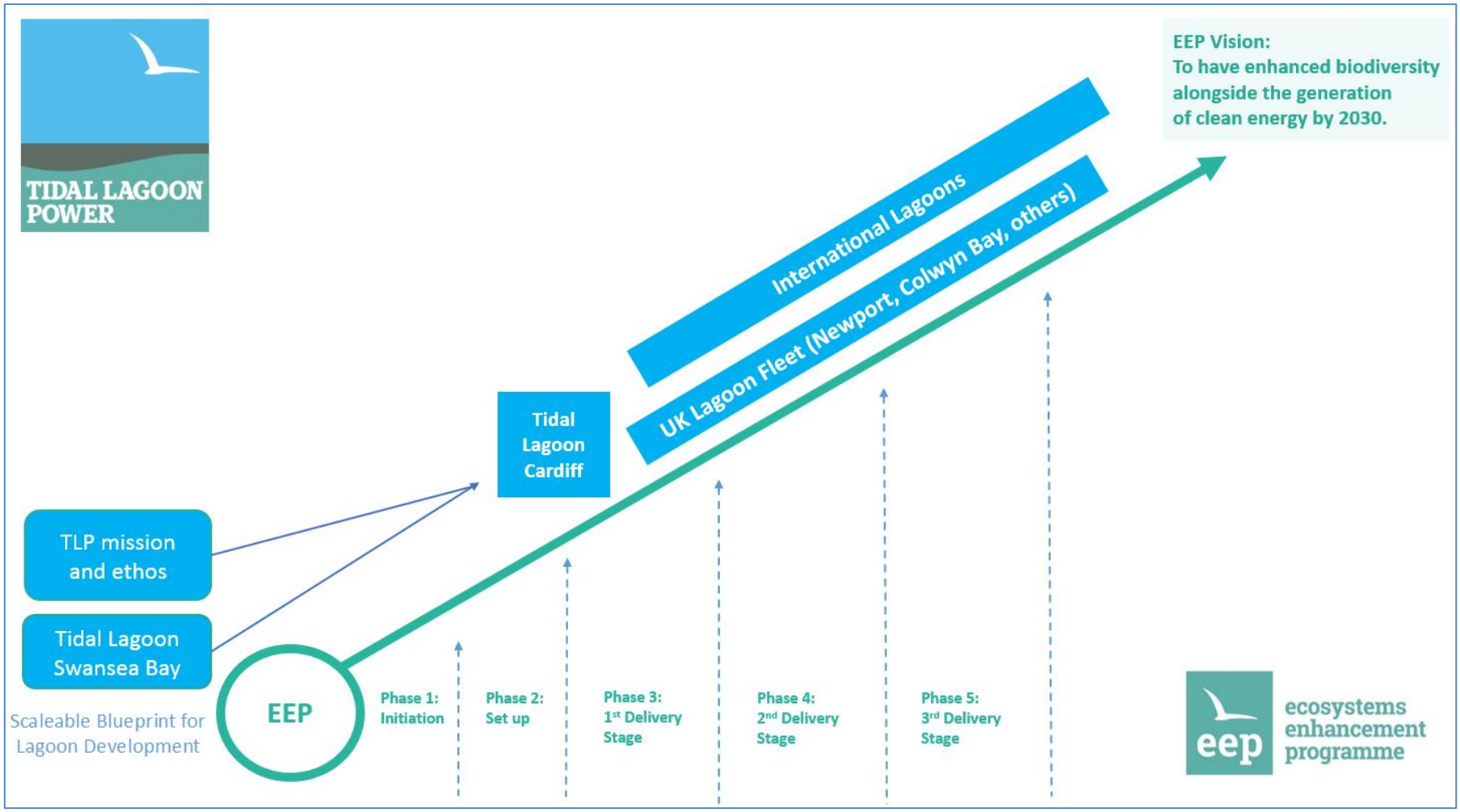

Figure 2: The phased delivery of the EEP towards its vision and its relationship with TLP's lagoon programme.

3.2 Strategic Objectives

Building on the EEP Blueprint, a phase of programme planning has been undertaken to establish a number of Strategic Objectives for the EEP. These objectives, along with associated actions and targets, will allow progress to be monitored and will help to ensure success on budget and to a high standard.

Table 1 sets out the EEP's Strategic Objectives. This is followed by a short discussion around each individual objective (A-F).

Table 1: The EEP's Strategic Objectives

A. Support TLP's efforts to minimise the impact of its projects by looking to maintain and enhance as far as possible the intertidal and subtidal resource in and associated with the lagoons.

B. Restore and create new wetland sites to maximise biodiversity and afford opportunities for climate adaptation, flood risk management, the historic environment, green tourism and education.

C. Support habitat restoration efforts for migratory and resident fish and birds through collaborative partnerships with local and global nature conservation organisations.

D. Deliver targeted enhancement initiatives for relevant features listed under the Habitats Directive / IUCN Red List species / UK Biodiversity Action Plan (BAP) priority species, supporting local and European-scale biodiversity conservation.

E. Enable changes in land management practices to support biodiversity and water quality improvements.

F. Establish long-term funding mechanisms to support the EEP.

Strategic Objective A. Support TLP's efforts to minimise the impact of projects by looking to maintain and enhance as far as possible the intertidal and subtidal resource in and associated with the lagoons.

TLP acknowledges the need to avoid, reduce and mitigate as far as possible the potentially significant impacts of lagoon development on terrestrial, intertidal and subtidal areas. For the Severn Estuary, this includes ensuring that the unique hyper-tidal nature of the estuary system is not compromised. Undertaking the Environmental Impact Assessment (EIA) for each lagoon development proposed will be central to the avoidance and mitigation of impacts at source.

As part of this design and assessment process, and early in the development of each project, relevant EEP and TLP experts will investigate ways to maintain and (where possible) enhance the intertidal and subtidal resource within and adjacent to the lagoons through the design of the lagoon infrastructure and its operating regime. This will entail design iteration and the consideration of water levels and sediment management within the lagoons (including the development of a dredging and habitat maintenance strategy). It is likely to involve proposals for intertidal habitat creation within the lagoons and the enhancement of the subtidal environment through, for example, adaptation of the lagoon bunds or structures to be installed within the lagoons, such as floating islands. Given the area of intertidal and subtidal habitat that will be encompassed by the lagoons, actions to optimise intertidal and subtidal function within lagoons offer significant potential to benefit biodiversity.

Strategic Objective B. Restore and create new wetland sites to maximise biodiversity and afford opportunities for climate adaptation, flood risk management, the historic environment, green tourism and education.

TLP is committed to meeting any compensatory requirements that arise due to lagoon development[7] in line with UK and EU nature legislation; acknowledging that significant habitat creation may be required. The approach in the EEP to the restoration and creation of wetland sites will seek to support and benefit wildlife in a holistic manner by maximising opportunities to enhance biodiversity in each case (e.g. through providing habitat transition, a mix of habitat types and meeting specific targets for the creation of mudflat) and ensure that these sites are designed to respond to the pressures of climate change. It is TLP's ambition that the majority of these sites will become part of the *Natura 2000* network, for example, as Special Protection Areas or Special Areas of Conservation.

Where the EEP is seeking to enhance local wetland ecosystems, innovative thinking will also enable multiple benefits to be delivered at the sites, as appropriate, by focussing on potential wider environmental, social and economic outcomes. The primary focus for this will differ across and between sites, for example, while access may be encouraged at some sites (for green tourism, education etc.), in other locations it will not be; and while certain sites will be suited to contributing to flood risk management or promoting the historic environment, others may not.

It is also relevant to note that the natural resources and marine wildlife connected to tidal lagoon developments are often highly mobile and functionally linked across wider areas than the immediate local environment, in some cases across much of Europe. In adopting an ecosystems approach to

[7] Based on an initial set of assumptions that (i) an adverse effect on the integrity of a European site will not be able to be avoided or fully mitigated through the measures to be put in place (bearing in mind TLP's aspiration to avoid an adverse effect on site integrity); (ii) less ecologically damaging alternative solutions are not available to fully meet the UK's renewable energy targets and harness the power of the tide; and (iii) Imperative Reasons of Overriding Public Interest can be demonstrated for lagoon development.

multiple lagoon development, potential conservation opportunities will be considered by the EEP across local, regional, national and European ecosystems.

Strategic Objective C. Support habitat restoration efforts for migratory and resident fish and birds through collaborative partnerships with local and global nature conservation organisations.

Migratory and resident fish and bird populations will clearly benefit from Strategic Objective B being met. However, in light of the wide ranging impacts and pressures on those ecosystems associated with the lifecycles of migratory and resident fish and birds, the EEP will take an ecosystems approach to its restoration efforts in the UK, Europe and (as appropriate) globally. This is likely to involve (amongst other things) defining, supporting and implementing upstream measures, for example, the removal of barriers to fish migration or reinstating river meanders or margins for fish; such efforts will be coordinated with the actions to be taken to meet Strategic Objective E.

The reason for isolating this objective from Strategic Objective B is that, in the context of migratory fish, it is recognised that there could be a residual impact associated with lagoon development (and fish passage through the turbines) on population levels that cannot be mitigated at source. This residual impact will, of course, need to be small enough for the lagoon developments to be acceptable in the first instance, but compensation measures (upstream and elsewhere) will still be sought.

Working with like-minded organisations and individuals to share resources and expertise will be the most effective way for the EEP to deliver concrete actions for biodiversity locally and globally.

Strategic Objective D. Deliver targeted enhancement initiatives for relevant features listed under the Habitats Directive / IUCN Red List species / UK Biodiversity Action Plan (BAP) priority species, supporting local and European-scale biodiversity conservation.

Despite conservation efforts, a number of key species and habitats continue to be degraded or are in unfavourable condition/decline. The EEP will therefore take a targeted approach to supporting the restoration and recovery of important wetland species and habitats.

This objective will be delivered in conjunction with the delivery of Strategic Objectives B and C. Good project design (e.g. optimising design so as to increase habitat and biodiversity values by providing safe alternative roosting and loafing areas for bird communities) will allow targeted species enhancement initiatives to be delivered.

Strategic Objective E. Enable changes in land management practices to support biodiversity and water quality improvements.

Working with land owners to change land management practices to enhance biodiversity and increase environmental stewardship (for example, by limiting access to the edge of waterways for grazing through fencing or by planting) will be an extremely effective way for the EEP to improve the condition of natural resources, such as soil, wetlands and water. A particular focus for this will be the Rhymney River in the first instance in relation to the Tidal Lagoon Cardiff proposal and other catchments on the Welsh side of the Inner Severn Estuary.

Strategic Objective F. Establish long-term funding mechanisms to support the delivery of the EEP.

The EEP aims to transition from being funded predominantly by TLP's lagoon programme (capital investment) to become financially independent and self-sustaining. This will include lagoon revenue and other potential income sources such as tourism and agriculture. Action is therefore required in order to determine how best to achieve this, ensuring that local amenities at the wetland sites do not incur high levels of wildlife disturbance.

4 Ecosystems Enhancement Programme – *phased delivery*

4.1 Programme and Resourcing

As depicted in Figure 2, phased delivery is proposed for the EEP. This is largely a function of the need to direct available resources (capital spend and staff capacity) towards priority areas of work and ensure the delivery of results.

TLP has established a team of EEP staff that is distinct from but integrated with TLP's fleet lagoon environment, planning and engineering teams, who are focused on consenting and delivering future lagoons. The capabilities of the EEP team include a range of skills and expertise in, for example, EIA, Habitats Regulations Assessment, marine nature conservation, biodiversity offsetting, land acquisition and marketing and communications. As a combined resource, this team has the necessary capacity to take the EEP forward. In time, further resources will be added as required to respond to the phased delivery of the programme.

4.2 Building on Tidal Lagoon Swansea Bay

A key aspect of the development of the Tidal Lagoon Swansea Bay (TLSB) proposals has been the establishment of an adaptive management process to address uncertainties associated with this lagoon scheme (given its first of a kind status). Known as the Adaptive Environmental Management Plan (AEMP), its primary purpose is to undertake adaptive monitoring to confirm (or not) the predicted/modelled impacts of the lagoon and the effectiveness of the mitigation measures. The AEMP also goes much further than this, in order to provide information to inform existing management practices and to guide future lagoon developments. The AEMP is a rolling programme that will progress through the construction and operational phases of the Swansea Bay lagoon.

Such an approach will allow TLP to capture and transfer the learning gained from TLSB, so as to build adaptability into the future lagoon programme, the design of future lagoons and the delivery of the EEP.

4.3 Working Towards Tidal Lagoon Cardiff: wetland creation

In the first instance, the focus of the EEP will be on the delivery of the compensation and ecosystem scale mitigation requirements associated with Tidal Lagoon Cardiff (TLC), as this is the most advanced lagoon (in planning and assessment terms) within the future lagoon programme.

To inform this area of work, research has been undertaken into precedent cases of coastal habitat creation, both intertidal and subtidal, and catchment-scale biodiversity improvement and restoration. There are number of examples from both the UK and internationally that establish the principles of intertidal habitat creation and represent best practice in terms of costs, timeframes, monitoring and partnership working. Such case studies readily demonstrate that intertidal habitat can be created to successfully support coastal bird populations affected by development, and provide wider benefits such as flood risk management, community amenity and wildlife tourism. Three such precedent examples, Allfleet's Marsh, Welwick and Medmerry, are detailed below (and in Figure 3).

- ***Allfleet's Marsh, Crouch and Roach Estuaries***

This 115ha managed realignment project was developed following port development on intertidal habitat at Fagbury Flats in the Orwell Estuary and Lappel Bank on the Medway. Allfleet's Marsh is 50km and 22km away, respectively, from the locations at which the losses occurred. A replacement ratio of 2:1 (replacement land to development land) was applied in this case due to the delay between the loss of habitat in the 1980/90s and the delivery of compensation in 2006[8]. Notably the site has exceeded its bird assemblage targets by over 200%. Monitoring over a period of 10 years has shown that twice as many birds are using this site (designed for water birds) than the number of birds that made use of the sites that were lost. The intention is for this site to be of sufficient quality to be designated as an extension of the Crouch and Roach SPA and Ramsar site by 2016[9]. Following the success of this site, the RSPB, in partnership with Defra, the Environment Agency and Crossrail, are returning an adjoining 670ha of arable farmland to wetland in one of the most ambitious coastal environmental projects in Europe so far – the Wallasea Wild Coast Project.

- ***Welwick and Chowder Ness, Humber Estuary***

These two sites, amounting to 69ha, were developed to compensate for losses associated with the construction of a roll-on roll-off terminal at Immingham Outer Harbour by Associated British Ports in 2006. A replacement ratio of 2:1 was applied, with the requirement that mudflat must not fall below a replacement ratio of 1:1 in the long term. This was considered to be acceptable because the developer committed to taking further measures if the required habitat and species targets were not achieved. The two schemes were designed to provide feeding habitat for over 800 waterbirds, which equated to a replacement to loss ratio of 1:1 in terms of birds numbers[10]. Ongoing monitoring has shown the mudflats have performed well with the average abundance, diversity and biomass of invertebrate species in 2009 being similar to the levels associated with the fronting pre-existing mudflat[11].

- ***Medmerry Reserve, West Sussex***

The 500ha site close to Pagham Harbour on the south coast took two years to construct at a cost of £35million. The site is run in partnership by the Environment Agency and the RSPB and the completed scheme is the largest managed realignment of the open coast in Europe to date. The site was designed to provide flood defence to over 350 homes, businesses and infrastructure, reducing flood risk to a 1 in 250 year event and saving a public spend of over £300,000 in flood defence maintenance per annum. In addition, it has created saltmarsh, mudflat and tidal lagoons that compensate for coastal squeeze losses on the Solent[12]. The site has been successful in providing habitat for waterfowl with high bird usage but also offers wider benefits to the local community by providing a number of footpaths, cycle paths and horse-tracks, and attracting visitors to the area.

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[8] ABP Marine Environmental Research Ltd (2013). Compensation and Mitigation Measures in Relation to Natura 2000 sites. *Inner Thames Estuary Feasibility Study*. [http://content.tfl.gov.uk/d-abpmer-compensation-and-mitigation.pdf].

[9] Wallasea Wetlands Creation Project – Allfleet's Marsh (2011). [http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69200/DEF-PB13469_Wallasea_WEB.pdf].

[10] Jennings, K. Immingham Outer Harbour port development, Humber Estuary, UK: Application of Articles 6(3) and 6(4) of the Habitats Directive to a major infrastructure project, RSPB. [http://econat-network.org/docs/documents/Session4_Estuaries_PAPER_Immingham.pdf].

[11] Manson, S. and Pinnington, N. (2012). 'Welwick' Measure analysis 34 in the framework of the Interreg IVB project TIDE, *Tidal River Development*. [http://www.tide-toolbox.eu/pdf/measures/Measure_Welwick.pdf].

[12] Medmerry coastal realignment: success for people and wildlife, RSPB. [https://www.rspb.org.uk/Images/medmerry_tcm9-405348.pdf].

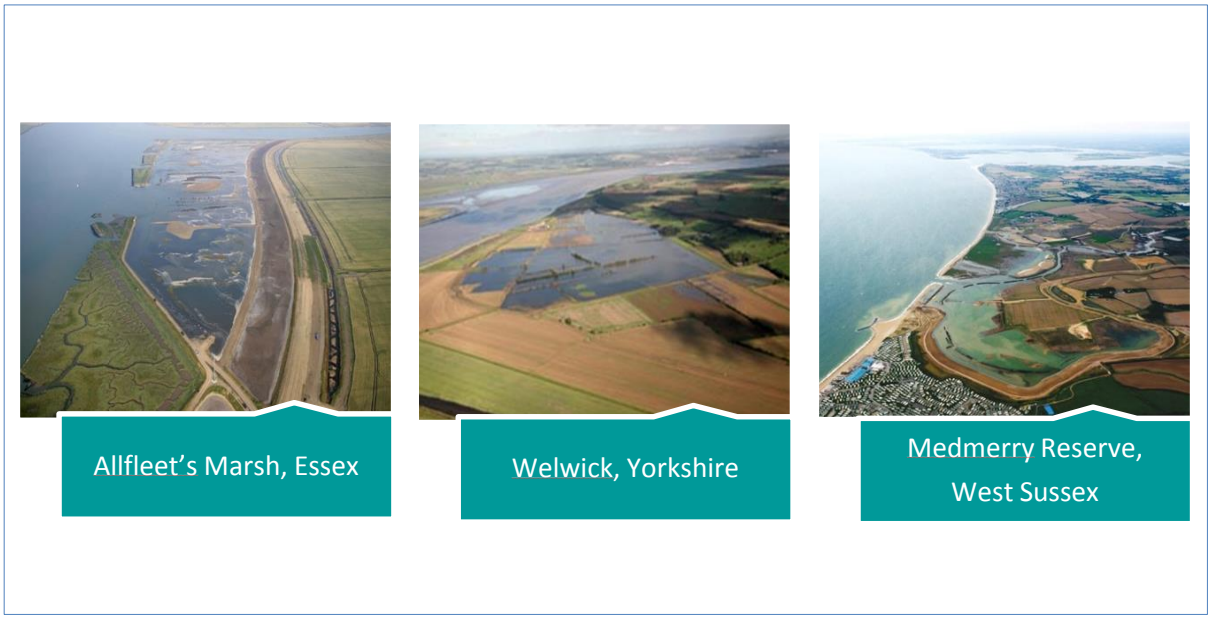

Figure 3: Images of three precedent examples of wetland creation in the UK.

In defining the requirements for the provision of compensatory 'habitats', replacement ratios should be based on a number of factors that relate both to the type and extent of the impacts and the nature of the compensation proposed. They will, by their nature, vary on a case by case basis. With respect to the impacts predicted, whether they are expected to be direct and indirect (and of major or minor significance) or are precautionary, will have a significant influence on the extent of compensatory habitat determined to be required. With respect to the nature of the compensation proposed, its location (distance from the point of impact), similarity in terms of habitat type and conditions, sustainability, timing (with regard to the provision of functional habitat) and the certainty of delivery will all strongly influence the required replacement ratio.

As the impact assessments associated with TLP's lagoon programme have yet to be completed, final compensation requirements and targets for habitat types and features (mudflat, saltmarsh, migratory fish etc.), are yet to be established and agreed with the statutory nature conservation bodies. However, TLP aim to provide best in class compensation through the EEP, such as that provided at Allfleet's Marsh - which exceeded its bird assemblage targets in year five by 200% - or that provided at Trimley Marshes in the Orwell Estuary - a site that was included with the Stour and Orwell Estuaries SPA inside five years. The EEP will adopt a pragmatic, risk-based approach to establishing these requirements in order to develop a compensation strategy that aims to achieve the buy-in of all stakeholders.

To this end, initial high-level estimates of the potential impact of the development of a tidal lagoon in the vicinity of Cardiff have been made based on an aggregation of likely losses due to the direct effects in the footprint of the lagoon wall/infrastructure and associated ongoing maintenance dredging, and indirect losses due to water level changes (reductions in tidal range) in the Severn Estuary. On a precautionary basis, this impact is predicted to have the potential to affect some 700 to 1000ha of intertidal habitat. Hence the EEP currently has a target to provide up to 2,000ha of intertidal habitat for TLC, including an allowance for the potential displacement of compensation measures in space and time, but acknowledging the opportunity to take action within the lagoons. This work is being actively progressed now, ahead of the confirmation of the level of predicted impact, given the requirement to

demonstrate that this level of compensation can be achieved, as well as where and how this could be achieved. Furthermore, compensatory measures proposed in England will need to be included in the Development Consent Order (DCO) application for TLC.

Whilst it is recognised that this is a significant target, TLP are confident that this can be achieved and delivered through the EEP. This is demonstrated through research commissioned by TLP that has identified around 109,000ha of coastal land in England and Wales that could be reinstated as coastal wetlands. In investigating these opportunities the EEP is adopting a hierarchy in terms of the location as follows: within the lagoon, adjacent to the lagoon, within the Severn Estuary, within or adjacent to the Bristol Channel, on the Welsh Coast, within other UK estuaries and coastal zones used by the shorebird populations of the Severn Estuary and then, if required, functionally linked locations within the Atlantic Biogeographical Zone.

4.4 Actions for Delivery

For each of the six EEP Strategic Objectives (A-F) presented in Section 3.2, a series of actions and associated targets have been developed to guide the implementation of the EEP. The actions presented below are not exhaustive, but are key activities of high priority for Phase 2 of the EEP (as defined in Figure 2).

Strategic Objective A: *Support TLP's efforts to minimise the impact of projects by looking to maintain and enhance as far as possible the intertidal and subtidal resource in and associated with the lagoons.*

1. Enhance TLP's understanding of how lagoons can be operated so as to mimic natural tidal behaviour, through careful design and the management of water levels in the lagoons to reduce the loss of functional intertidal habitat/the reduction in tidal exposure, whilst also considering the effect on the energy balance/generation of the lagoon.
2. Identify opportunities to maintain, create or enhance intertidal habitat, including mudflat and saltmarsh, within the lagoons and/or in areas of accretion. Both tried and tested methods and innovative techniques will be piloted, for example, the use of floating wetlands.
3. Based on an understanding of the extent and quality of the subtidal resource associated with lagoons, identify opportunities to enhance this through the design of the lagoon wall and mechanisms such as the introduction of reef rolls, and artificial or biogenic reefs.
4. Support the development of an appropriate sediment management strategy for TLC, so as to maintain the form and function of defined areas of the intertidal and subtidal resource.
5. Scope measures for contributing to the wider suite of European designated subtidal features that will be directly or indirectly affected by lagoons. For example through the identification and protection (through promotion for designation) of subtidal features (such as subtidal sandbanks) that are present in locations other than the Severn Estuary but not designated (for SACs not all qualifying features have been designated). Examples of where such an approach has provided compensation acceptable to the European Commission have been identified. For example, the designation of two sandbank sites with a combined area of approximately

7,491ha (100km away from Tenerife Island) was associated with the new Port of Granadilla development as compensation for impacts on the sandbank feature.

Strategic Objective B: *Restore and create new wetland sites to maximise biodiversity and afford opportunities for climate adaptation, flood risk management, the historic environment, green tourism and education.*

1. Identify the anticipated levels of compensatory habitat required for the future lagoon fleet, based on the direct and indirect habitat change impact assessment predictions as they evolve.
2. Research and investigate best practice and precedent examples of coastal habitat re-creation projects, including the use of sediment recharge.
3. Develop a pragmatic, risk-based compensation strategy in consultation with key relevant parties, such as the Welsh Government, Defra, Natural Resources Wales, the Environment Agency and Natural England. This will focus on the provision of compensation within or adjacent to the affected European site (and adjacent to the lagoons) in the first instance, and then opportunities for habitat creation elsewhere in the UK and, if necessary, within the Atlantic biogeographical region (where habitat/species connections can be established, e.g. flyways or migratory routes).
4. Implement a Land Acquisition Strategy that includes site identification; land referencing; land owner engagement and negotiations; scheme design(s); EIA(s) and planning processes. The area of search for TLC will focus first and foremost on the Severn Estuary, and then sequentially on Wales and the South West of England (where the potential to create saltmarsh and grazing marsh exists). However, for the creation of mudflats, potential intertidal habitat creation sites will also be investigated on the East coast of the UK. It is acknowledged that in realigning seawalls to create intertidal habitat, important freshwater and terrestrial habitats may be affected. This will be avoided or any effects mitigated as far as possible, which may entail the creation of new grazing marsh (for example).
5. Determine the most suitable way in which to deliver land options as part of the consenting process for the lagoons and other permissions; as well as in partnership with other parties that want or need to meet habitat creation targets.
6. Explore opportunities for maximising biodiversity at identified sites to support flora and fauna and, in particular, UK BAP priority species and habitats.
7. Identify opportunities for flood risk management at relevant sites.
8. Develop visitor access strategies for the identified sites; for example, the provision of public footpaths, cycle paths, wheelchair routes and viewing points, with minimal disturbance to wildlife. It should be acknowledged that visitor access will be discouraged from certain sites.
9. Establish partnerships to develop and manage selected sites including, where appropriate, amenities relating to recreation, ecotourism and heritage. This will include putting in place agreements and conservation covenants with site partners for the EEP's first suite of wetland sites, aligned to the delivery timetable for TLC.

10. Deliver maximum community amenity through local community involvement in some sites, for example, through the development of citizen science and heritage centred initiatives and/or education materials.
11. Monitor all sites in which TLP has an interest, with the view to propose certain sites for designation as either Special Protection Areas (SPAs) or Special Areas of Conservation (SACs).

Strategic Objective C: *Support habitat restoration efforts for migratory and resident fish and birds through collaborative partnerships with local and global nature conservation organisations*.

1. Identify target species of fish and birds, the key pressures they face, and management/ conservation efforts that would have value.
2. Identify relevant partnerships or programmes that are aligned with the EEP's vision and that are open to collaborating on potential restoration efforts to deliver conservation action.
3. Implement or support flagship fish migration restoration project(s), based on the agreed actions. For TLP participation, such measures need to be over and above those that third parties are required to implement to achieve regulatory compliance, that is, actions which land owners or resource managers are generally expected to undertake. A key area of potential work includes establishing a task force to prepare a Migratory Fish Road Map for the Severn Estuary (or similar) and, by the end of 2016, identifying a set of priority measures to be taken.
4. Develop and implement a targeted external engagement plan to support relationship building with key partners and stakeholders.
5. Use marketing and communications, including hosting an inaugural EEP conference in 2017, to share EEP and partnership-based conservation initiatives.
6. Where appropriate, participate in/join key conservation forums and/or initiatives where there are shared outcomes.

Strategic Objective D: *Deliver targeted enhancement initiatives for relevant features listed under the Habitats Directive / IUCN Red List species / UK BAP priority species, supporting local and European-scale biodiversity conservation.*

1. Based on the findings of the future lagoons impact assessment process, identify features that may be affected by the proposals that would benefit from support elsewhere (i.e. outside the Zone of Influence of the projects) in the UK and Europe.
2. Identify opportunities for key species or features (as above) to be supported through the habitat creation programme to be delivered through Strategic Objective B.
3. Explore current conservation initiatives for key species, their successes and limitations and apply the most effective of these measures to a range of critical sites, for example, key flyway sites across Europe currently defined as being 'in danger' by Birdlife International or changes in land management practices that increase the success of breeding waders.
4. Identify relevant partnerships and enhancement initiatives/projects.

Strategic Objective E: *Enable changes in land management practices to support biodiversity and water quality improvements.*

1. Investigate mechanisms that can be used to enable or incentivise land owners to bring land under increased environmental stewardship that may serve as compensatory/offsetting measures for TLP (e.g. wetland/river restoration or creation to support birds and fish, establishment of habitat buffers/corridors and/or reed beds to improve water quality, etc.).
2. Identify and review effective approaches that have been adopted elsewhere, for example, agri-environment schemes that have been successfully implemented.
3. Engage with other organisations, such as the Rivers Trusts, who have successfully implemented Payment for Ecosystem Services (PES) schemes across the country to share information and best practise.
4. Scope PES opportunities with key stakeholders, including water companies, farming unions and Rivers Trusts.
5. Implement a PES study (or pilot studies) within the Severn Estuary (with appropriate management and monitoring in place).

Strategic Objective F: *Establish long-term funding mechanisms to support the delivery of the EEP.*

1. Identify the most appropriate delivery vehicle for the EEP (e.g. a limited company, a Community Interest Company, a charity etc.) and establish this in 2017/2018.
2. Identify EEP research gaps and priorities for external funding proposals.
3. Scope external organisations with whom TLP could potentially partner in funding applications to support the EEP's objectives.
4. Define how green tourism and recreation/education revenues at EEP wetland sites (only where appropriate and in line with the conservation objectives of the site) could be used to support the site's operational costs.
5. Identify the means by which the future revenue streams from lagoons could contribute to the EEP, especially in the context of continuing to meet compensatory commitments in the long-term.

4.5 External Stakeholder Engagement and Partnership Working

During the summer and autumn of 2015, TLP met with close to forty organisations to introduce the EEP. This targeted stakeholder engagement focussed on the national tier within key UK stakeholder bodies, including conservation and environmental interest groups. This dialogue was effective in raising awareness of TLP's proposed approach to biodiversity conservation, generating considerable interest and high-level feedback on the EEP that has been used, for example, to refine and validate a number of the EEP's Strategic Objectives.

A second phase of external stakeholder engagement will take place throughout 2016/2017. This will include meeting with regional and local stakeholders and maintaining ongoing dialogue with those organisations where partnership-based nature conservation initiatives can be taken forward.

One of the EEP's aims is to foster partnerships that could help identify, deliver and manage projects, where appropriate and possible. A clear area where this could successfully come into play is in regard to managing EEP wetland sites as nature reserves, including visitor amenities and heritage centred initiatives. TLP firmly believe that partnership working with like-minded organisations to share resources and expertise will be the most effective way for the EEP to deliver definitive actions for biodiversity locally and globally.

5 Ecosystems Enhancement Programme – *strong governance*

Given the infancy of the tidal lagoon industry, associated uncertainties and the clear need to ensure that legal obligations are met (such as those associated with the EU Birds and Habitats Directives), TLP will be the focus of external scrutiny from both regulators and stakeholders. Taking this into account, strong guiding principles and governance practices will be put in place to steer the direction and delivery of the EEP.

TLP consider it to be important to ensure that there is robust governance of the EEP, so as to provide confidence and trust in the approach, as well as accountability and transparency in the development and delivery of the initiatives under the programme.

5.1 Principles

The EEP will be underpinned by the following principles that will guide decision-making and working practices:

- *Collaborative.* We will engage early and on an ongoing basis with the aim of working closely with key stakeholders and organisations to develop ideas and deliver conservation action. For example, on a without prejudice basis, we are currently in discussions with the Sustainable Eel Group and The Flow Partnership on joint initiatives, and are learning lessons on the management of managed realignment sites from the Wildlife Trusts, RSPB and Wildfowl and Wetlands Trust. In addition, where possible, TLP will enter into negotiated agreements with land owners with the intention that they continue to manage their land for nature conservation purposes.
- *Pioneering*. Our work will be innovative, trialling new solutions and approaches to biodiversity enhancement in the coastal zone; with the intention of showcasing how infrastructure development should be investing in the environment and responding to climate change.
- *Outcome Focused*. Action and investment through the EEP will be focused on meeting TLP's compensation commitments and maximising the benefits for biodiversity in a sequential way (i.e. as future lagoon projects are brought forward, it enables us to invest more).
- *Sustainable and Adaptive*. TLP is committed to ensuring that compensatory habitats are maintained over the lifetime of lagoons. The EEP will focus on multi-ecosystem benefits and aims to ensure that these areas of habitat creation become part of a resilient ecological network that has space to adapt and evolve as sea-level rises and in the face of other climatic changes.
- *Cost effective*. EEP initiatives will be focused on achieving the best outcome for nature conservation within the budget available.

5.2 Strategic Oversight

Oversight will be achieved by the establishment of a Governance Board that will be independently chaired and include membership external to TLP. The objectives of the Governance Board will be to provide direction and advice to the EEP team on its wide range of conservation activities and outcomes, for example, on what can be considered to be best practice in conservation terms and where enhancements can be best achieved.

TLP envisages the EEP Governance Board will include stakeholders from the following fields:

- A climate change leader.
- An environmental economist.
- An environmental NGO(s).
- A leader in international conservation.
- An expert in biodiversity and ecosystem services.

In addition, the EEP team will seek to join and collaborate with existing groups and individuals, or processes, that have previously or are currently aiming to address the joint issues of biodiversity, climate change and energy security, such as the Cambridge Conservation Initiative and the Sustainable Severn Forum. Such efforts to ensure robust governance will complement internal governance processes such as TLP's EEP Steering Group.

5.3 Structure

To support the intended transition of the EEP into a financially independent structure, TLP is currently investigating various options for delivery vehicles (company structures) for the EEP, with a view to establishing a delivery vehicle in 2017/2018.

Legal entity options under consideration include, but are not limited to:

- Charitable Entity;
- Community Interest Company (CIC);
- Public Limited Company (PLC);
- Social Enterprise.

Relevant issues include ensuring financial flexibility, independence, access to funding opportunities, and the ability to discharge legal commitments in perpetuity.

If you have comments on this document or would like to discuss working in partnership with TLP's EEP, please contact Sian John, Environment Director. Email: eep@tidallagoonpower.com